

TENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | | |
|---|---|--|---|
| Applicant's or agent's file reference P2746/WOD | FOR FURTHER ACTION | | see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. |
| International application No. PCT/GB 99/ 04099 | International filing date (day/month/year) 06/12/1999 | (Earliest) Priority Date (day/month/year) 08/12/1998 | |

Applicant

THE SECRETARY OF STATE FOR DEFENCE et al.

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1
☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

P B 99/04099

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L51/20

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H01L C09K H05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | <p>DAUB J ET AL: "Electrochemiluminescence and efficient light emitting diodes based on multifunctional dyes: Donor/acceptor substituted stilbenoids and difluoroboradiaza-s-indacenes"</p> <p>PROCEEDINGS OF THE 1997 ACS SAN FRANCISCO MEETING; SAN FRANCISCO, CA, USA APR 13-17 1997,</p> <p>vol. 38, no. 1, April 1997 (1997-04), pages 339-340, XP000889787</p> <p>Polym Prepr Div Polym Chem Am Chem Soc; Polymer Preprints, Division of Polymer Chemistry, American Chemical Society Apr 1997 ACS, Washington, DC, USA</p> <p>the whole document</p> <p style="text-align: center;">--- -/-</p> | 1 |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"A" document member of the same patent family

Date of the actual completion of the international search

8 March 2000

Date of mailing of the international search report

16/03/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
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Authorized officer

De Laere, A

INTERNATIONAL SEARCH REPORT

International Application No.

P 99/04099

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| A | PATENT ABSTRACTS OF JAPAN vol. 1998, no. 03, 27 February 1998 (1998-02-27) -& JP 09 289081 A (MITSUBISHI CHEM CORP), 4 November 1997 (1997-11-04) abstract ----- | 1 |
| A | US 5 189 029 A (BOYER JOSEPH H ET AL) 23 February 1993 (1993-02-23) cited in the application abstract ----- | 1 |
| A | US 5 677 572 A (HUNG LIANG-SUN ET AL) 14 October 1997 (1997-10-14) column 3; example 1 ----- | 1-4,6-8 |
| A | WO 97 32452 A (UNIAX CORP) 4 September 1997 (1997-09-04) abstract ----- | 1,2,4-6 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

P 99/04099

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| JP 09289081 A | 04-11-1997 | NONE | |
| US 5189029 A | 23-02-1993 | US 5446157 A | 29-08-1995 |
| US 5677572 A | 14-10-1997 | NONE | |
| WO 9732452 A | 04-09-1997 | US 5798170 A | 25-08-1998 |
| | | AU 2192197 A | 16-09-1997 |

PCT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

| | |
|---|---|
| Date of mailing (day/month/year) 18 July 2000 (18.07.00) | |
| International application No. PCT/GB99/04099 | Applicant's or agent's file reference P2746/WOD |
| International filing date (day/month/year) 06 December 1999 (06.12.99) | Priority date (day/month/year) 08 December 1998 (08.12.98) |
| Applicant SAGE, Ian, Charles et al | |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

10 June 2000 (10.06.00)

☐ in a notice effecting later election filed with the International Bureau on:
2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Juan Cruz

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

COMMUNICATION IN CASES FOR WHICH
NO OTHER FORM IS APPLICABLE

From the INTERNATIONAL BUREAU

To:

BOWDERY, A.O
Qinetic Limited
IP Formalities
A4 Bldg. Cody Technology Park
Ively Road Farnborough
Hampshire GU14 0LX
ROYAUME-UNI

| | |
|---|--|
| Date of mailing (<i>day/month/year</i>) 08 October 2001 (08.10.01) | |
| Applicant's or agent's file reference P2746/WOD | REPLY DUE see paragraph 1 below |
| International application No. PCT/GB99/04099 | International filing date (<i>day/month/year</i>) 06 December 1999 (06.12.99) |
| Applicant THE SECRETARY OF STATE FOR DEFENCE | |

1. ☐ REPLY DUE within _____ months/days from the above date of mailing
- ☐ NO REPLY DUE, however, see below
- ☒ IMPORTANT COMMUNICATION
- ☐ INFORMATION ONLY

2. COMMUNICATION:

The International Bureau has received, on 23 July 2001 (23.07.2001), a notification concerning the change of applicant.


However, please be advised that the International Bureau has not recorded the said change (except for the purpose of correspondence with the International Bureau) nor sent Form PCT/IB/306 (Notification of the Recording of a Change under PCT Rule 92bis) to elected Offices, since the time limit referred to in Article 39 has expired (see PCT Rule 92bis and PCT Administrative Instructions, Section 422).

Any further proceedings concerning the above-mentioned international application should now take place before the elected Offices

| | |
|---|--|
| The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland | Authorized officer Maria Victoria CORTIELLO |
| Facsimile No. (41-22) 740.14.35 | Telephone No. (41-22) 338.83.38 |

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| | | | |
|---|--|---|--|
| Applicant's or agent's file reference IPD/P2746/WOD | | FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) | |
| International application No. PCT/GB99/04099 | International filing date (day/month/year) 06/12/1999 | Priority date (day/month/year) 08/12/1998 | |
| International Patent Classification (IPC) or national classification and IPC H01L51/20 | | | |
| Applicant THE SECRETARY OF STATE FOR DEFENCE et al. | | | |
| <p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of sheets.</p> | | | |
| <p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none">I <input checked="" type="checkbox"/> Basis of the reportII <input type="checkbox"/> PriorityIII <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicabilityIV <input type="checkbox"/> Lack of unity of inventionV <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statementVI <input type="checkbox"/> Certain documents citedVII <input type="checkbox"/> Certain defects in the international applicationVIII <input type="checkbox"/> Certain observations on the international application | | | |
| Date of submission of the demand 10/06/2000 | | Date of completion of this report 29.08.2000 | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 | | Authorized officer Cockcroft, Y Telephone No. +49 89 2399 2436 | |



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB99/04099

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-14 as originally filed

Claims, No.:

1-11 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB99/04099

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|------|--------|------|
| Novelty (N) | Yes: | Claims | 1-11 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-11 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-11 |
| | No: | Claims | |

2. Citations and explanations

see separate sheet

To Point V

D1 = Proceedings 1997 ACS San Francisco Vol.38, No. 1, pages 339-340, 1997;
D2 = Patent Abs.. Japan, Vol. 1998, No. 03, 1998 & JP-A-09-289081;
D3 = US-A-5 189 029;
D4 = US-A-5 677 572; and
D5 = WO 97 32452.

The application details an organic light emitting diode wherein only a single organic layer is present. This layer comprises hole and electron transporters and a light emitter and the claim specifies three groups of compounds which are suitable for use as the light emitter and/or the electron transporter. All of the suggested compounds are complexes of BF_2

The closest prior art is considered to be D1 which shows a pyrromethane- BF_2 complex for use in an organic LED. The first suggested formula for A-D in claim 1 of the application is also a pyrromethane- BF_2 complex. However, the specific compound of D1 differs from that in the claim in that the group Q is an aryl group in the prior art but an alkyl group in the current application. It is quite clear from the last sentence of D1 that the authors had not been able to form a functioning LED with only a single layer using their chosen compound. The slightly different compound of the application is however suitable for inclusion in a single layer and can thus be seen as a selection of a compound not suggested in the prior art to give the advantageous effect that a device with a single layer can be fabricated without compromising on the efficiency of the device.

The pyrromethane- BF_2 complexes suggested in claim 1 are also seen in D2 but the LED of this document has two layers; a hole transporting layer and an organic electron transporting layer. Thus the authors of D2 did not realise that a single layer device could be fabricated when these specific compounds were selected.

D3 details the pyrromethane- BF_2 complexes of the application used as fluorescent compounds in laser dyes. LEDs are not mentioned. D4 discusses an organic electroluminescent device and D5 is concerned with LEDs but neither of these documents mention complexes of BF_2 .

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB99/04099

Thus none of the prior art documents appears to suggest an organic LED having a single active layer comprising the specified BF_2 complexes. The claimed subject matter would thus appear to satisfy the requirements of Article 33.2 and 33.3 PCT.